



Magazine by MARL

For Maltese and Gozitan  
Radio Amateurs

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Tpejjipx  
No Smoking

## Smoking is prohibited at the Centre

### From the Editor

Friends,

I welcome you to another issue of this magazine for September 2007, which is issue 19 of this series.

The first thing that I would like to do is to thank in my name and in the name of all the members Fortunato and all those who took part in repairing and again installing the Yagi antenna that we have at the Club. Thus whoever comes to the Club can use the apparatus on this antenna on **14, 21 and 28 MHz**. It can also be used on **50** and **144 MHz**.

I would also like to thank **George 9H1AT**, **Maria 9H1BG** and **Joseph 9H1AJ**, as well as all those who took part to organize the **BBQ** held on 29 September, as well as all those who came and enjoyed themselves with us because without them we would not have been successful. I hope that following this year's success and the help that George has found, we will organize more than one **BBQ** next year.

During the **BBQ** certificates were presented both to those who were successful in the radio amateurs examination and the **CW** examination.

#### These have passed the Radio Amateur Examination

**Agius Joseph**

**Aquilina Joseph**

**Azzopardi Maria**

**Chetcuti Matthew**

**Debono Joseph**

**Xerri Jason**

**Xerri Kenneth**

**Zammit Matthew**

**9H5AJ (now 9H1AJ)**

**9H1BG (ibbukkjata)**

**aqujoe@maltanet.net**

#### These have passed the Morse Code Examination

**Aquilina Joseph**

**9H1AJ**

**aqujoe@maltanet.net**

**Azzopardi Maria**

**9H1BG (Booked)**

**stevenfenech@yahoo.com**

**Fenech Steve**

**9H1SF (ex-9H5SF)**

**Laus Peter**

**Chetcuti Matthew**

We congratulate the radio amateurs who were successful in the examinations and also those who after passing the radio amateur examination did not stop there and continued to study and also were successful in the Morse code examination. They are an example to others that if you want to you can succeed.

**A resit will be held on 20 October and a new radio course will start on 4 November.  
Therefore those who want to attend the course register early**

We don't want to forget to give special thanks to those who patiently trained not only those who were successful in the last examinations, but also those who were successful in previous examinations.

I do not doubt that when the lecturers see their success through those who were successful in the examination they will continue to be encourage and continue their useful work so that our hobby will continue to move forward in the Maltese Islands.

I hope that you are finding the information in the magazine useful to you and if you have any article please leave it in my QSL box.

### **Lawrence 9H1AV / 9H9MHR**

#### **Think a little**

It appears that following my last article about Einstein, the space platform, the space capsules and radio signals, there were some who thought a little bit more than usual. There were some who asked how, if the radio signals that are transmitted both from the space capsules as well as the space platform travel at the same speed, the signals from one space capsule do not reach the other space capsule while they arrive at the space platform, and those sent from the space platform also arrive at the space capsules.

This is very simple. Remember that relative to each other, the space capsules will be travelling at more than the speed of light and therefore they will be separating from each other at the same speed.

Therefore, since the signals will be sent with the speed of light but at the same time the space capsules will be separating at a greater speed, effectively the radio signals will be moving in two directions at the same time.

One direction is away from the space capsules at the speed of light, and at the same time in the direction of the space capsules that had sent them, which, in this case, the speed towards the space capsules that had sent them will be the difference between the speed of light and the speed with which the space capsules will be separating from each other.

Therefore, the radio signals that travel at the speed of light can never arrive from a space capsule to the other space capsules. The following drawing helps to understand what I am saying.



Let's say that we have three space capsules and take the three arrows as indicating the direction of the space capsules, one (C) is going in one direction at a speed of 10 and the others (A) and (B) going in the opposite direction, one with a speed of 10 and the other with a speed of 8. The relative separation speed between the capsules will be the sum of their speed.

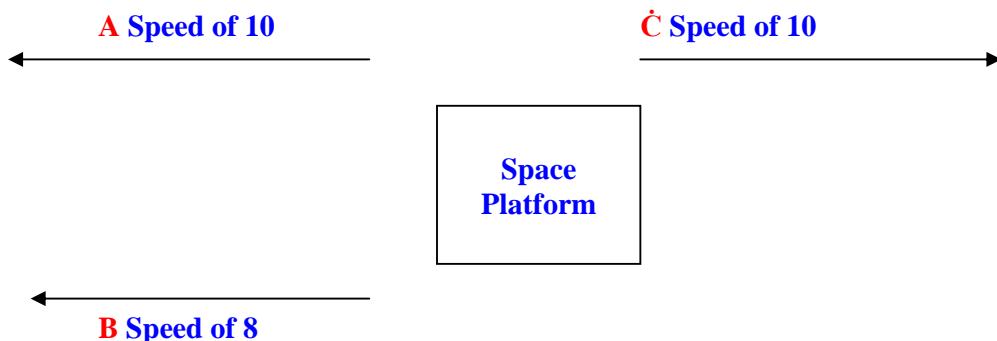
Therefore, the separation speed between the space capsules A and C = 10 + 10 = 20, and between the space capsules B and C = 10 + 8 = 18.

Let's say that the radio and light signals travel at a speed of **15**. Therefore, if space capsule **C** sends radio signals towards the other capsules **A** and **B**, they will travel with a speed of **15** towards the other space capsules.

At the same time, because the space capsules will be separating from each other, one (**A**) with a speed of **20** and the other (**B**) with a speed of **18**, effectively the radio signals will be travelling backwards in the direction of capsule **C** that had sent them with a speed of  **$20 - 15 = 5$**  with respect to capsule **A**, and  **$18 - 15 = 3$**  with respect to capsule **B**.

This is an example of how an object, in this case we are considering radio signals, that travel with one speed can be considered to travel with more than one speed relative to objects that will be travelling at a different speed and effectively even backwards at the same time.

On the other hand, the speed with which the capsules will be travelling relative to the space platform is less than the speed of light. With two of them, **A** and **C**, the speed is **10** and with **B** the speed is **8**.



Thus, effectively, a radio signal sent from space capsules **A** and **C** travel towards the space platform with the difference of  **$15 - 10 = 5$** , and the same happens to a signal sent from the space platform towards the space capsule **A** or **C**.

Between the space capsule **B** and the space platform and back, the speed of the radio signals will be  **$15 - 8 = 7$** .

Therefore, the radio signals from the space capsules towards the space platform and from the space platform towards the capsules will arrive just the same. The above drawing shows what I mean.

This is the reason why the signals sent from one space capsule to the other do not arrive while by means of the platform they will be able to talk between themselves.

There is another difference. This is that although the radio signals will be travelling at the speed of light relative to the space capsules that send them, they will be travelling at a lower speed relative to the space platform.

This is because while the radio signals are being sent the space capsules will be travelling, if you remember, away from the platform at a speed slightly greater than half the speed of light.

Therefore, the speed of the capsules will have to be deducted from the speed of light as I have previously shown, with the result that although the radio signals are sent from the space capsules with the speed of light, the effective speed will be less than half the speed of light or with the difference with which the space capsules will be travelling.

All this also applies to radio signals sent from the space platform towards the space capsules because of the speed of the space capsules away from the space platform.

Do not forget that the speed of the space capsules is the reason why a correction is needed to the frequency because of Doppler shift when the signals sent from the space capsules are received on the space platform and vice-versa.

Whoever has worked through satellites that are circling around the earth knows what I mean, because he will have to change the received frequency all the time to continue to hear the signal correctly because the satellite will be moving. This notwithstanding, that the radio signals frequency sent by the satellite always remain the same.

In this case, if the satellite is moving towards him, first he will have to change the frequency to a higher one and when away from him to a lower one.

This happens because while the satellite is travelling towards him, the frequency effectively will appear to be higher because the signals will be compressed and appear to be catching with each other in a manner that he will be receiving more cycles (Hertz) per second.

On the other hand, if the satellite is travelling away from him, the frequency will appear to be lower because the signals will appear to be spaced from each other in a manner that he will receive less cycles (Hertz) per second.

Remember that while the satellite is moving at a certain speed, the speed that we are considering in the case of the space capsules example is enormous when compared with the speed of satellites. Therefore, the frequency correction to radio signals sent from the space capsules and from the space platform must be much greater than that which is made in the case of satellites.

If we arrive at the extremity that the speed with which the space capsules will be travelling relative to each other is greater than the speed of light, the cycles (Hertz) of radio signals will be so spaced that they will never arrive from one to the other. In fact, it can be considered that the frequency is changed so much and reduced that it becomes zero and will have disappeared.

What do you think about these thoughts and concepts?

### **Lawrence 9H1AV / 9H9MHR**

#### **Modernization of Radio apparatus**

Is your radio equipment old and not so selective? It does not have filters, or an **SSB** filter or **CW** filter? Or you cannot find a filter for it or it cost a lot of money? Do you want to do something to be able to hear better quality signals without modifying that equipment and without spending a lot of money? Do you want to give new life to your equipment?

I think that many radio amateurs will answer yes to these questions because they have a receiver or transceiver that they wish was more selective. If you have a computer it is easy to do what I have told you, and you can even do it for a few cents if not for free. Are you interested? Then read on.

Today you can say that you will find a computer in every home, new or perhaps not so new. But even if you do not have a computer it is easy to buy a second-hand one that will not cost a lot of money because many people change their computer with a modern one.

If you see modern radio equipment, a lot of it uses what is called **DSP** instead of quartz crystal or mechanical filters or together with such filters. **DSP** means **Digital Signal Processing**, or the processing of signals in a digital manner.

With this system, the signals will be processed by means of digital systems with dedicated programmes that make it possible to create different digital filters with which to filter and separate signals from other signals and interference or even to process signals that you send to others.

In modern equipment, this process is normally carried out in the equipment itself where everything will be included in the radio equipment with the required programmes that can even be updated with new developments that there may be.

However, there are now computer programmes that you can use with all your radio equipment with which you can modernize it and in many instances you will make it as efficient as modern ones. And moreover there are free programmes.

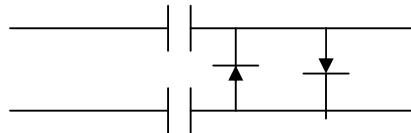
One of these programmes that I have tried is that written by **Makoto Mori, JE3HHT**, and is a **DSP** Filter. This is one of a series of programmes written by **Makoto**, among them **SSTV** and **RTTY** and other programmes that apart from being good are also free.

All you have to do is to download the programmes, install them on your computer, read the instructions, connect your radio apparatus with your computer, open the programme and use it.

If you are going to use **SSTV** or **RTTY** you have to make a small circuit with two transistors that may be **2N2222A** or similar ones that only cost a few cents so that the programme will be able to control your transceiver.

If you are only going to use the **DSP** programme, I suggest that you make a small circuit to isolate the computer from the radio apparatus so that you will always be certain that you will not cause any damage if there are some DC voltages and even to limit the signal levels.

This circuit is only two capacitors on each side of the screened wire similar to that used for microphones and two diodes with opposite polarities to limit the signal levels.



The two capacitors can be about **.1uF** and two silicon diodes to limit the signals to around .6 to .7 volts. If you want you can make the capacitors of a higher value, while the diodes can be of the **1N4001 – 7** series etc.

You can connect them as you wish, the two diodes side may be on the radio apparatus side or the computer side, although I put the diodes on the radio apparatus side, i.e., connected to the radio loudspeaker.

You normally connect the two computer left and right hand channels together and use the microphone or line input of the soundcard, whichever you find best. Do not forget that you have to listen on the computer speakers.

You can also use this circuit if you want to record any telephone calls. In this case, the diodes side is connected to the tape recorder side and the other side to the telephone line. I can assure you that you will have very good recordings of both ends of the line.

To come back to our subject, all you have to do is to open the **DSP** programme that you had installed on your computer, choose what filter you want, connect the radio to the computer, find the station you want to listen to on the radio, adjust the receiver volume so that it will be enough for the computer and programme to work without having the signal too high that it will be heavily limited by the diodes.

When you open the programme a window will appear on the monitor screen from where you can choose the filter that you want and you can hear the difference between different filters according to the interference that there may be.

You have six **SSB** filters of **1.8, 2.0, 2.2, 2.4, 2.5 u 2.7 kHz**, six **CW** of **500, 400, 300, 200, 100** and **70 Hz**, and there are some other filters that you can design according to your requirements.

For **CW** you start by using the **500 Hz** filter and then use narrower filters as required according to the interference. The programme lets you choose the audio frequency that you feel comfortable to copy between **400** and **900 Hz** every **50 Hz**. The received signals can also be seen in the same window from where you choose the filters and other choices.

It is very important to read the short 5-page instructions that come with the programme because they are very important, especially since you will have to make some small adjustments that are clearly explained.

If you leave out some adjustments you will hear the signals with an echo of about half a second between one signal and the other due to the time taken by the programme and computer to process the signal.

You can remove it totally by reducing the microphone volume from the mixer (if you are using the microphone for the radio input as I am doing).

You have to first adjust the volume by opening the mixer panel, go to recording and adjust it from there.

I assure you that when you try it on receivers that do not have many filters you will not believe the difference that this programme makes, especially when there are other interfering signals on nearby frequencies.

The result? Another use for the computer, better signals as those found in modern equipment, a new life for old radio equipment, and moreover free or with little expense of a few cents and without modifying your radio equipment.

To download the programmes go to the internet webpage <http://mmhamsoft.ham-radio.ch> and you will find the necessary links. There is also a Yahoo group that uses these programmes which you can find on the internet webpage <http://groups.yahoo.com/group/MM-HAMSOFT>

I hope that you will find this information useful and will start to again use apparatus that you will have put aside for a more modern one.

**Lawrence 9H1AV / 9H9MHR**

## News

As you all know, today most apparatus is not built on an aluminium or steel chassis, except if it is a valve power amplifier or something else that requires a chassis of certain strength.

In fact, what is known as a printed circuit has been used for a long time, where instead of an aluminium or steel chassis a piece of paxolin or fibreglass covered with copper is used. There are also other types of insulation instead of paxolin or fibreglass because when we go up on microwave frequencies there will be high losses in isolation and electronic circuits will not work or work correctly.

In fact, when a printed circuit is going to be used on audio frequencies it is enough to use paxolin insulation, but when we go up on radio frequencies we have to use fibreglass insulation.

There are printed circuits that have copper on one side and there are others that have copper on both sides. For certain other reasons, such as for electronic circuits to be more stable especially on radio frequencies and to have very short connections to the circuit earth, we used those that have copper on both sides.

The electronic components can be attached by drilling holes where needed and soldered, as well as with the more modern system that allows the circuits and very small electronic components to be connected to the printed circuit without any having leads.

In fact, they are making components so small, that there are diodes, resistors and also other components that they are fitted between one side and the other of the printed circuit through its thickness. That is, components between 1.5 and 2 mm long

The printed circuit will first have the electronic circuit with the necessary connections printed on it, and then the circuit that we want to make will be etched by a chemical process acting on the copper so that when the printed circuit is used it creates the connections between the components.

If you think that this process is very difficult to do you have to think otherwise. First of all because when you see it being done you will become aware that it is easy, and secondly whoever wants to build something will have to make one.

We don't need to tell you that one should not start with a big double-sided circuit that would have to be etched on both sides with many electronic components, but first start with a small simple circuit and then go on to more complicated circuits.

As it is said, a picture is worth a thousand words, and if we apply this to what we are talking about, we can say that it is also said that an ounce of practice is worth a ton of theory.

We are therefore going to hold a practical demonstration of how one can make this process that if you read about it you have to read a lot and probably you will not understand everything, but if you see the process you will see how easy it is.

Therefore, all those interested should come to the **MARL Club** on the following dates where there will be **Karmenu, 9H1AQ** who is going to give practical examples of how one can make printed circuits.

These dates are going to be on **Tuesday 23 October, Thursday 25 October, and Sunday 28 October 2007**. The time is **Tuesday and Thursday** from **6.00 p.m. onwards** and on **Sunday** from **10.00 a.m. onwards. Be there on time.**

Things used in this process are a copy of the printed circuit design printed on a transparency, caustic soda, ferric chloride, ultra-violet light, and a printed circuit that is sensitised to ultra-violet light.

I suggest that no one should miss such an opportunity because as it is said, although theory is good, necessary and you cannot do without it, an ounce of practice is worth a ton of theory.

We thank **Karmenu, 9H1AQ** for offering to do this practical presentation.

### **Lawrence 9H1AV / 9H9MHR**

#### **Australian licences**

You may have heard or worked with an Australian radio amateur and hear their call sign with four letters following the number For example, **VK1FABC**. Such a call sign is granted to those who have an entry-level licence and it will always start with the letter **F** after the number. The **F** is to indicate that it is a Foundation licence.

There are two other licence classes, one that is the normal one and the other advanced. The normal one has three letters, that is, to take an example, **VK1xxx** where the first letter following the number is always **H, L, M, N, P or V**.

The other call signs both with three letters as well as with two letters following the number are for the advanced licence except those whose first letter following the number is the letter **R** which indicates a repeater or beacon.

#### **500 kHz**

Today you have a list of radio amateurs that are transmitting on a frequency of 500 kHz from Europe.

<b>Call Sign</b>		<b>Frequency</b>	<b>ERP Watts</b>	<b>QTH</b>	<b>Grid</b>
<b>Experimental</b>	<b>Normal</b>				
DI2AG	DJ2LF	505.090	0.4 – 2	Dormitz	JN59no
DI2AM	DL3NRV	505.180	9	Rostock	JO64bd
DI2BE	DJ8WX	505.120	9	Munsterdorf	JO43sv
DI2BO	DK8KW	505.015	1.7mW	Peine	JO52bh
DI2KA	DK1KQ	Not QRV	9	Cuxhaven	JO43iu
OK0EMW	OK2BVG	505.060	1	Breclav	JN88ks
SM6BHZ	SM6BHZ	505 – 505.2	20	Frolunda	
G3KEV	G3KEV		0.1	Scarborough	IO94sh
G3OLB	G3OLB	503.485	0.1	Honiton, Devon	IO80iu
G3WBC	G3WBC	503.800	0.1	Iver, Bucks	IO91rm
G3YMC	G3YMC	501-504	0.1	Bracknell Berks	IO91pj
G3XIZ	G3XIZ	503.95	0.1	Biggleswade	
GW3UEP	GW3UEP	501.500	0.1		
G4WGT	G4WGT	503.600	0.1	Coppull Lancs	IO83qp
GI4DPE	GI4DPE	501.100	0.1	Derry	IO64ix
GM4SLV	GM4SLV	503.750	0.1	Clousta, Bixter	IP90gg
GW4HXO	GW4HXO		0.1	Haverfordwest	
G0MRF	G0MRF	503.7	0.1	Hounslow, Msex	IO91tk
M0BMU	M0BMU		0.1	Hatfield	IO91vr

You can find this list on [http://500kc.com/non\\_us\\_stations.htm](http://500kc.com/non_us_stations.htm)

There's no need to tell you that presently you will not find anyone from Malta.

### More on Softrock 40

If you are interested in the Softrock (a software defined radio kit) I described in the May 2007 MARL newsletter, then the first step is to sign up for membership of the Yahoo group for this project.

<http://groups.yahoo.com/group/softrock40>.

This gives access to the very latest information on the status of the various kits, FAQs, how to order, assembly/build instructions, testing & debugging, computer interfacing, software downloads and of course message connection with at least 3000 other interested persons.

If you simply wish to purchase a Softrock kit and don't want to use Yahoo or PayPal, several Amateur Radio outlets do sell them (at about twice the price) as advertised in Ham radio magazines.

### How does SDR actually work?

Many articles have been written about software-defined radio (SDR), but they are usually rather technical. Here I attempt to give a very much-simplified view of direct conversion radios using computer processing. Hopefully this will allow you to understand the basics.

### Sine waves

As with much in electronics, we depend on sine waves and their properties. The two fundamental properties of a time varying sine wave we need are:

1. The time-averaged amplitude of any sine wave is zero.
2. Multiplication of one sine wave by any another also results in a time-averaged amplitude of zero.

However there is **ONE VERY IMPORTANT EXCEPTION**. If the frequency of the two sine waves is absolutely identical, then the average is non-zero.

### Spectral Analysis

A real situation of examining the output from a receiving antenna, in fact shows there are a multitude of RF sine waves present of different frequencies and amplitudes. By principle **1** above, this of course time-averages to zero.

In a receiver, the incoming signal is multiplied by a pure sine wave (called the local oscillator), whose frequency is known. Whenever that frequency coincides with a component at the same frequency in the received signal, by the principle **2** above, there will be an output. This is the basis of spectral analysis.

### Aliasing

Now let's examine what happens in the receiver when the two multiplied sine waves are of slightly different frequencies. This generates another sine wave (again time-average value is zero) but with a frequency equal to the **DIFFERENCE** between the signal and the local oscillator frequencies. (Remember that when there is no frequency difference, the resulting sine wave has zero frequency and so has a fixed amplitude, as stated in principle 2 above).

Look now at an example, where the local oscillator is exactly **10.000 MHz**. and suppose a difference frequency is detected of **1 kHz**. There is an ambiguity, because the incoming signal frequency could be at either **10.001 MHz** or at **9.999 MHz**. to give a **1 kHz**

difference. Over the years, receiver designers have developed various solutions to overcome this “aliasing” difficulty.

### Direct Conversion

If the receiver directly processes the difference signal in the audio range, any RF variations are converted to audio and the process is known as direct or base-band conversion. Until recently such receivers were impractical, owing to the difficulty of resolving the aliasing ambiguity.

### I and Q demodulation

In the above example, a **10.001 MHz** received signal was multiplied by the **10.000 MHz** local oscillator and a **1 kHz** difference signal is thereby generated. Using the same received signal and the same **10.000 MHz** local oscillator but phase shifted, the **1 kHz** difference signal will also be phase shifted by the same amount as the local oscillator.

If this phase shift is made to be **90 degrees** then the difference frequency outputs are identified as **I** (in-phase), and **Q** (quadrature-phase), according to the phase of the local oscillator.

If now the signal frequency is **9.999 MHz** then the phase difference of the **I** and **Q 1 kHz** outputs will again be **90 degrees**, but in the opposite sense (since the local oscillator frequency is now higher than the signal frequency), permitting selective cancellation / reinforcement of the difference signal.

So, processing the **I** and **Q** signals, allows separation of the aliased signals and the choice of selecting signals from above the local oscillator frequency or below it.

### Practical realization in Softrock

The Softrock kits use a fixed local oscillator that runs at the centre frequency of the Amateur band that it is to handle. For example the **40-meter** band receiver will have a **7.050 MHz** local oscillator (for **7.000 MHz** to **7.100 MHz** signals).

The **90 degree** phased demodulator drives are generated digitally from a crystal-controlled oscillator at 4 times this frequency (**28.200 MHz**). The **I** and **Q** demodulator outputs will be audio signals up to **50 kHz** which are connected directly to the stereo line inputs of the computer sound card.

All processing and display, (audible and visual), is performed by the computer software under control of the user. There are several different software packages (usually free amateur radio downloads) available.

Other implementations exist for different frequency bands, some of which may require higher performance computers and sound cards to handle the audio bandwidth in real time.

### Transceivers

Exactly the same principle can be used in reverse, to generate RF signals using an-**I** and **Q** modulator driven by a computer sound card. Softrock TXRX kits are now available with 1-watt output for several amateur radio bands.

## Support

Anyone interested in any of the Softrock kits should sign up on the Yahoo group for Softrock40 in order to have access to current information and support for the project. <http://groups.yahoo.com/group/softrock40>. I would be happy to discuss/assist anyone here who has an interest in these kits or in software defined radio (SDR) in general.

### Robin 9H1ZZ

In issue 17 of this Magazine we had a photo of the scout activity on the Floriana Granaries and this photo did not indicate who the persons were. Today therefore we are again including this photo with call signs.



**9H1SF Steve** front and **9H1PS Arthur**

### Scouts Radio Jamboree

I would like to remind you that the yearly scout radio jamboree that has been held for the last 50 years is to be held this month. This year it will be held on Saturday 20 and Sunday 21 October. Anyone wanting more information can go to <http://www.scout.org/jota/> or to [http://www.scout.org/en/information\\_events/events/jota/50th\\_jota\\_2007](http://www.scout.org/en/information_events/events/jota/50th_jota_2007)

Details of a certificate commemorating the 100 anniversary of the scouting movement may be found on [www.scouting100award.org](http://www.scouting100award.org)

A number of stations from Malta are going to participate and therefore we invite you to see who is going to take part and contact them.

These are going to take part in the jamboree: **Arthur 9H1PS, Joe 9H1AJ, John 9H1XT**.

**9H1PS** will be at Rinella, **9H1AJ** will be at Mellieħa, and **9H1XT** will be at Xghajra in Haż-Żabbar. There will also be others that will be taking part, and therefore whoever wants to take part should talk to those mentioned or find a group of scouts that wish to participate.

Don't forget that if they see someone communicating with other stations worldwide, they may be enticed to start on our hobby that will continue to distance them from dangerous vices and may be an incentive to start a career in electronics.

I ask all those who take part to write a few words on what they had done during the jamboree and send me some photos so that we can publish them on this magazine. My e-mail is 9h1av at searchmalta.com or 9h9mhr at searchmalta.com

### Lawrence 9H1AV / 9H9MHR